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Calibrating Home and Garden Sprayers

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Pesticide manufacturers spend millions of dollars getting their products approved by the Environmental Protection Agency. This includes determining the most effective amount of pesticide to apply to a particular pest. Both time and money are wasted when improper pesticide rates are used. By applying too much pesticide you increase the potential for contamination of both surface and groundwater. Your personal safety is also at risk when you apply too much pesticide.

Calibration

For pesticides to be effective, they must be applied uniformly at the recommended rates noted on the label. Calibration ensures that the correct amount of pesticide (the labeled rate) is applied in the proper dilution (a given volume of water) to control a particular pest. Failure to properly calibrate pesticide sprayers is the most frequent cause of ineffective pesticide applications. Always read and follow the product label.

Pesticide Safety

Most pesticides sold in the home and garden trade do not require special protective clothing, but anytime you handle and apply pesticides it is good insurance to wear a long-sleeved shirt, long-legged trousers (or a coverall-type garment), waterproof boots and unlined neoprene or rubber gloves (a lining can absorb pesticides). When handling or applying any pesticides, never wear shorts, sandals, tennis shoes, or leather footwear and always read the pesticide label.

Typical Sprayers Used For Home and Garden Use

Compressed Air Sprayers

Two common types of compressed air sprayers used for home and garden use are the **backpack** and hand-held **tank** or **canister** sprayers. Both are useful for small jobs where only a few gallons of material are needed. It is important to maintain a constant pressure by pumping the sprayer regularly during application. It is equally important to maintain the same pressure during the actual application as you do during calibration of the sprayer.

Hose-End Sprayers

Hose-end sparayers attach directly to the end of a garden hose and are easy to use. They consist of a plastic reservoir or jar to hold a mixture of water/pesticide and a lid that contains a tube that siphons the pesticide from inside the jar and distributes it uniformly into the water flow. The jar is generally marked with two scales: fluid ounces and gallons. When you fill the jar with a water/pesticide mixture up to one of the gallon marks, you will be applying that many gallons of **finished spray** over a given area. For instance, a pesticide label might call for 1 ounce of product in 1 gallon of water to cover 400 square feet. When you fill the jar up to the one gallon mark, your goal is to cover 400 square feet with that amount of liquid.

Some hose-end sprayers come with a “dial-in” option. You add undiluted pesticide to the jar and then turn the dial on the sprayer body to the labeled rate.

Steps In Calibrating Any Type Of Liquid Sprayer

1. **Calculate the area to be sprayed.**
   Example: 20 feet x 20 feet = 400 square feet (ft^2).
2. **Calculate the dilution factor.** Divide the area you want to spray by the area noted on the pesticide label. This will give you a dilution factor.
   For Example: If you want to spray an area that is 1000 ft^2 and the label says apply 1 ounce of product per 200 ft^2, your dilution factor is 5 (1000 ft^2 ÷ 200 ft^2 = a dilution factor of 5)
3. **Determine the total volume needed.** If the label does not recommend that a certain volume of water be used, you can determine your own by adding a measured amount of water to the spray tank or jar and then spray the area. Adjust nozzle openings and spraying speed for

the type of spray pattern desired. On trees, shrubs and other upright growing plants, spray until the pesticide solution begins to drip from the leaves. For soil-applied pesticides, make sure that you have a coarse spray. For dial-in hose-end sprayers, adjust the setting to the recommended dilution rate on the product label. Make certain the water is applied uniformly, with no gaps and with only a small amount of overlap.

4. **Determine the amount of pesticide to apply.** Multiply the dilution factor times the rate found on the label. ***For Example:*** From Step 2, a label calls for you to apply 1 ounce of pesticide per 200 ft^2 and you have a dilution factor of 5. You will apply 5 ounces of pesticide to cover 1000 ft^2 (5 x 1 = 5 ounces).

5. **Add the proper amount of pesticide to the canister or jar according to the label.**

Backpack Sprayer Example

You have a 5-gallon backpack sprayer. The area you want to spray is 50 feet by 35 feet and the pesticide you want to use calls for 2 ounces of product to be applied over 500 ft^2. For calibration purposes, you started with 5 gallons of water in your sprayer.

- **Step 1:** 50 ft. x 35 ft. = 1750 ft^2
- **Step 2:** 1750 ft^2 ÷ 500 ft^2 = 3.5 dilution factor
- **Step 3:** You sprayed the area with water and you had 1 gallon left. Therefore you used 4 gallons to cover 1750 ft^2.
- **Step 4:** 2 ounces of product per 500 ft^2 x 3.5 = 7 ounces of pesticide to be applied to 1750 ft^2
- **Step 5:** You will now add 7 ounces of pesticide in four gallons of water to spray 1750 ft^2.

Now spray the designated area using the same time, pressure and spray motion as when you calibrated. Consistency is the key to effective pest control. If you have some left over, you went too fast. If you ran out, you went too slow.

Some labels may be very precise; "use 3 ounces of a product in 2 gallons of water applied to 1000 ft^2." In this case you will need to make sure that you are applying 2 gallons of water per 1000 ft^2. It may take a few times to get the speed and pressure just right in order to consistently apply the right amount of volume to a given area.

Hose-End Sprayer Example 1

The label for Smoke'em® herbicide calls for you to mix 2 tablespoons of pesticide with 1 gallon of water to cover 200 ft^2. You want to spray an area that is 26 feet x 27 feet.

- **Step 1:** 26 ft x 27 ft = 702 ft^2
- **Step 2:** 702 ft^2 ÷ 200 ft^2 = 3.51 or 3.5 dilution factor
- **Step 3:** 3.5 x 1 gallon-per-200 ft^2 = 3.5 gallons of finished spray that is desired to cover 702 ft^2. Add only water up to the 3 1/2–gallon mark on the jar and spray the 702 ft^2 area. You should use the whole amount. If you did not, adjust your spraying speed and try again. Don't add pesticide yet.
- **Step 4:** 3.5 dilution factor x 2 tablespoons = 7 tablespoons of product for a 702 ft^2 area.
- **Step 5:** You will add 7 tablespoons of Smoke'em® herbicide to the jar and then fill with water up to the 3-1/2-gallon mark

IMPORTANT:

Since hose-end sprayers are attached directly to the end of a garden hose, a sudden loss of water pressure in the system can draw (back-siphon) the pesticide from the jar into your water supply.
ALWAYS INSTALL AN ANTI-SIPHON DEVICE BETWEEN THE WATER SPIGOT AND A HOSE-END SPRAYER.

Hose-End Sprayer Example 2:

You want to spray an area that is 25 feet by 10 feet. Grub-Out® insecticide calls for a rate of 5 tablespoons in 3 gallons of water to cover 1000 ft^2.

- **Step 1:** 25 ft x 10 ft = 250 ft^2
- **Step 2:** 250 ft^2 ÷ 1000 ft^2 = 0.25
- **Step 3:** 3 gallons-per-1000 ft^2 x 0.25 = 0.75 or 3/4 gallons per 250 ft^2. Add water up to the 3/4-gallon mark and spray the area. Again, if you have some left over, you went too fast. If you ran out, you went too slow.
- **Step 4:** 0.25 x 5 tablespoons-per-1000 ft^2 = 1.25 or 1-1/4 tablespoons in 3/4 gallons of water to spray a 250 ft^2 area.
- **Step 5:** You will add 1 1/4 tablespoons of Grub-Out® insecticide to the jar and then fill with water up to the 3/4-gallon mark to cover 250 ft^2.

Useful Measurements and Conversions

1 gallon = 4 quarts = 8 pints = 128 ounces

1 cup = 8 ounces

1 quart = 2 pints = 32 ounces

1 ounce = 2 tablespoons = 6 teaspoons

1 pint = 2 cups = 16 ounces

1 tablespoon = 1/2 ounce = 3 teaspoons

Gallons = Ounces ÷ 128

Ounces = Gallons x 128

Area Measurements

To determine how much pesticide you will need to do a job, you must measure the area to be treated. If the area is a rectangle, circle or triangle, simple formulas may be used. Determining the area of an irregularly shaped site is more difficult. The following examples will help you in computing the area of both regularly and irregularly shaped areas.

Rectangles

The area of a rectangle is found by multiplying the length by the width. (See Figure 1.)

Example: *40' x 125' = 5,000 ft²*

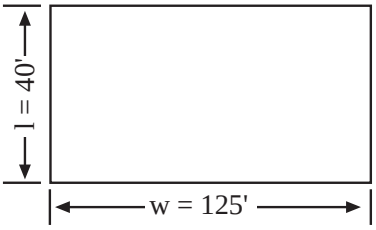

Figure 1. Area of a rectangle

Circles

The area of a circle is the radius (1/2 the diameter) squared and then multiply by 3.14. (See Figure 2.)
Area = r² x 3.14

Example: *r = 35 feet*
35' x 35' x 3.14 = 3846.5 ft²

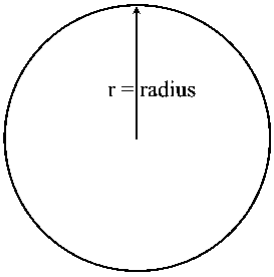

Figure 2. Area of a circle

Triangles

The area of a triangle is one-half the base (b) multiplied by the height (h) (See Figure 3.)

$$\text{Area} = \frac{b \times h}{2}$$

Example: *b = 55' h = 53' 55 x 53 ÷ 2 = 1457.5 ft²*

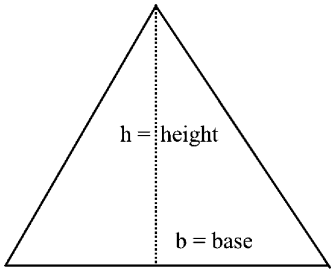

Figure 3. Area of a triangle

Irregular Shaped Areas

Irregular shaped areas often can be reduced to a combination of rectangles, circles, and triangles. Calculate the area of each and add them together to obtain the total area.(See Figure 4.)

b= 25'	*Calculate the area of a triangle:*
	Area = 1/2 b x h
h = 35'	*Area = (35 x 25) ∏ 2 = 437.5 ft².*
L1 = 40'	*Calculate the area of a rectangle:*
	Area = L1 x L2
L2 = 40'	*Area = 40 x 40 = 1600 ft².*
L3 = 5'	*Calculate the area of a rectangle:*
	Area = L3 x L4
L4 = 25'	*Area = 5 x 25 = 125 ft².*

Total area = 437.5 ft² + 1600 ft² + 125 ft² = 2,162.5 ft².

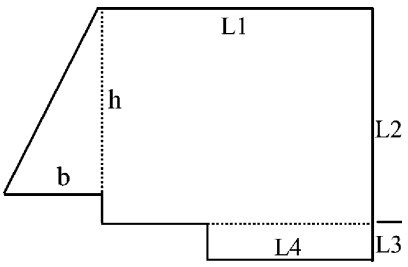

Figure 4. Irregular shaped area composed of geometric shapes

Using Measurements Along a Line

Another way is to establish a line down the middle of the property for the length and then measure from side to side at several points along this line. Areas with very irregular shapes require more side-to-side measurements. The average of the side measurements can be used as the width. Then calculate the area as a rectangle. (See Figure 5.)

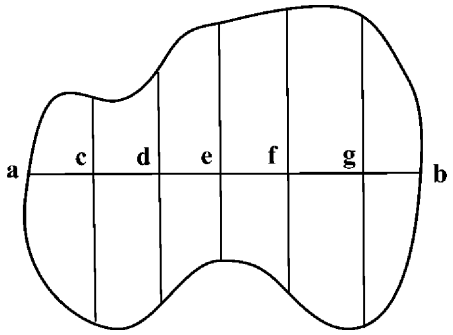

Figure 5. Irregular shaped area measured from points on a line

Example:

ab = 45' c = 22' d = 21'
e = 15' f = 17' g = 22'

$$\text{Area} = (ab) \times \frac{(c + d + e + f + g)}{5}$$

$$= 45 \times \frac{(22 + 21 + 15 + 17 + 22)}{5} = 873 \text{ ft}^2$$

Using Radial Measurements

A third method is to convert the area into a circle. From a center point, measure the distance to the edge of the area in 10 to 20 increments. Average these measurements to find the average radius. Calculate the area using the formula for a circle. (See Figure 6.)

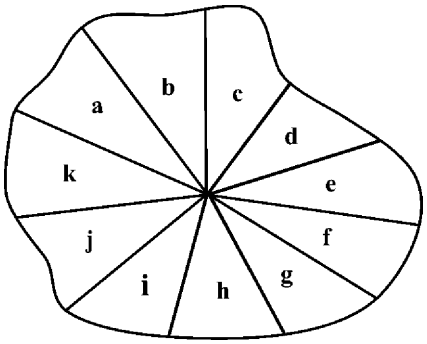

Figure 6. Irregular shaped area converted to a circle

Example:

$$\text{Radius} = \frac{a + b + c + d + e + f + g + h + i + j + k}{11}$$

$$\frac{11 + 12 + 15 + 16 + 18 + 14 + 15 + 16 + 11 + 12 + 14}{11} = \frac{154}{11} = 14$$

Area = 3.14 x radius squared
Area = 3.14 x 14^2 = 615.44 ft^2

For more information Contact:

- Your county office of the Cooperative Extension Service
- The Montana State University Extension Pesticide Education Program
  (406) 994-3518
  http://mtpesticides.org

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